

Exploring Age-appropriate Design Attributes of Hospital Activity Rooms for Adolescent Patients

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Abstract

Although health professionals have recognized critical connections between health outcomes and physical hospital settings, research data on adolescent patients' age-appropriate hospital design is insufficient, especially for activity rooms. To explore age-appropriate spatial needs and hospital room design attributes for adolescent patients, the present study examined their spatial needs in hospitals and their perceptions of hospital activity room photos. Thirty-two adolescent outpatients from a university hospital in Kentucky, aged between 15 and 18, completed the survey. Adolescents' spatial needs during their hospital stays were surveyed on a 5-point Likert scale, and the highly rated need was to have privacy control, followed by the need for quiet places and activity places. The participants' perceptions of the four hospital activity room photos were collected using twenty-two adjective words on a 5-point scale. The finding revealed that adolescent patients need activity rooms to meet and socialize with their peers during their hospital stays. The statistical analysis revealed enjoyable, controllable, and adult-like as the dominant design attributes of age-appropriate activity rooms for adolescent patients. Unlike activity areas in pediatric hospitals, adolescent hospital activity rooms should be enjoyable to adolescents and allow them to control privacy while providing opportunities to meet their peers.

Keywords: adolescent patient, activity room, design attributes, enjoyable, privacy control

1. Introduction

Research defined adolescence as a growth stage from childhood to adulthood, experiencing significant changes to the body and fluctuating emotional status, which makes them vulnerable to various situations in their daily lives (Casey et al., 2008; National Institute of Health, 2009). The changes in behavior resulted in influenced social interactions with peers (Spear, 2000). According to research, about one-third of adolescents spend about 30% of their daytime with peers and only 8% of the time with adults. Rapid physical changes that come along with cognitive development usually affect self-consciousness and sensitivity to the surrounding environments. According to the National Institute of Health Agency (2003), adolescents may experience risks of depression and some degree of suicidal emotion due to the pressures and conflicts occurring in various social interactions such as families, schools, and intimates. Bovier, Chamot, & Perneger (2004) recognized the changes in self-identity, physical growth, and interactions with peers as the basis for some general mistrust in adults. However, the same researchers emphasized chronic illness as adolescents' most challenging lifelong event in addition to the dramatic changes in their growing process.

Well-designed hospital room settings probably promote a certain degree of stress diminution and psychological benefit. Evaluation of the hospital environment by adolescent patients evidenced potential influences of interior design attributes on healing procedures under stressful hospitalization (Kim, 2022). Research investigating the effects of patient-oriented hospital environment design suggested some design features to enhance patients' healing process (Ulrich, 1984; Ulrich & Zhu, 2007; Verderber, 1986). Adams et al. (2010) emphasized the importance of the hospital experience by patients by revealing noteworthy differences between children's perceptions and healthcare design settings. Even though there are concerns and efforts to improve adolescents' healthcare environment, empirical research data is still insufficient to characterize a desirable design. Most research on adolescent healthcare has been focused on public health (Friman et al., 1996; Medicine, 2007), including social and behavioral aspects due to the uniquely dynamic natures of their growth. The impact of physical healthcare environments on adolescent health has received little attention. Therefore, more data

connecting the current understanding of hospital environments to the actual design applications have been required to boost young adults' healing. As Wallander & Varni (1995) indicated significant difficulties in adjustment when adolescents are in chronic conditions, some negative impacts of hospitalization are concerns related to biological, social, and cognitive developments of young adult patients (Sawyer et al., 2004; Blumberg & Devlin, 2006; Boice, 1998). According to the 2005 U.S. Department of Human Health Services report, approximately 9 % of adolescents aged between 10 and 17 experienced limited activities due to a chronic health condition. Yearly, about 13 million adolescents were cared for by emergency visits, and 1.8 million were hospitalized between 2002 and 2004 (MacKay & Duran, 2007).

Health-related quality of life (HRQOL) indicates patients' subjective perception of quality of life impacted by their medical conditions, internal characteristics, and external factors (Patrick & Chiang, 2000). The HRQOL has been recognized as an essential indicator of health outcomes not only by clinicians but policymakers as well (Varni & Kurtin, 1999; Guyatt et al., 1993) since it emphasizes the importance of a patient-centered approach and patients' subjective self-reported well-being rather than objective assessments by biomedical parameters (Sawyer et al., 2004). Thus, the study adopted the concept as the theoretical framework, as shown in Figure 1, since individuals' subjective perceptions of their quality of life and well-being, including the perception of the physical environments of hospitals (Abdullah & Jamal, 2010). Based on the theoretical framework, the study focused on understanding adolescent patients' preferences for hospital activity room design, emphasizing individuals' subjective responses, which reflect adolescents' characteristics.

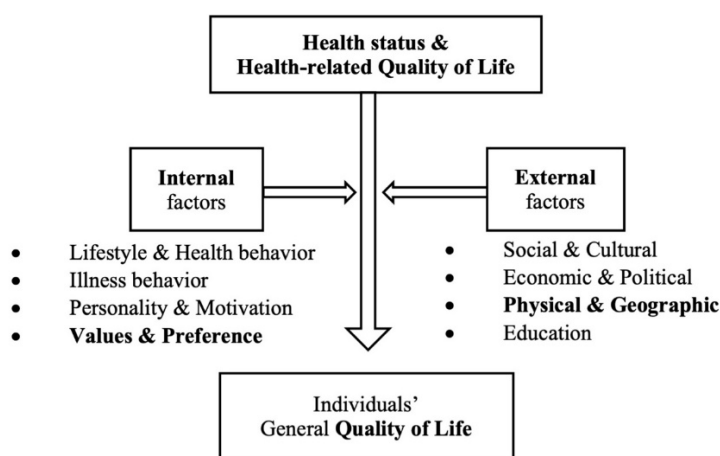


Figure 1. Health-related Quality of Life and Influential Factors

Adapted from Patrick & Chiang (2000, p.II-19)

Many health design studies have observed the positive impacts of the physical surroundings of hospital environments on patients' healing process. For example, visual access to the natural elements from patient rooms has proven beneficial to surgical patients' recovery by regulating anxiety and blood pressure levels, reducing medication intake, and shortening hospital stays (Ulrich, 1981). Friedrich (1999) valued aesthetically pleasing art as it boosts patients' healing process. Since healing environments include physical and cultural surroundings supporting patients and families, various hospital rooms, outdoor areas of hospital buildings, and artworks can contribute to patients' healing process (Harris et al., 2002; Whitehouse et al., 2001). As Gesler et al. (2004) suggested, hospital design should be comprehensively planned by combining physical, social, and symbolic attributes of environments that potentially provide positive experiences to patients. Although the spatial layout of rooms and window placements were not adjustable due to the architectural characteristics, the relatively easily changeable interior modifications, such as surface finishes and other interior features, could be easily adjustable to enhance potential healing effects. Hospital environments must be valued as a healing space for adolescents and differently valued from those of young children and adults. However, the impact of hospital environments on adolescent patients' healing has rarely been evaluated in healthcare design settings. To understand the dynamics of design features' contributions, the prospects of actual adolescent patients need to be quantified. Therefore, a continuous study following the previous investigation on healing design elements for patient rooms (Kim, 2022) was conducted to investigate adolescent patients' spatial preferences and design preferences on activity rooms in hospitals. Because of the age variability, the research limited the age of adolescent patient subjects from 15 to 18.

The survey was prepared to collect adolescent patients' spatial preferences for hospital rooms and their age-appropriate design attributes for activity area design.

2. Methods

2.1 Participants and Procedure

Adolescent patients were recruited at the Medicine Division in the University of Kentucky Clinic by following the hospital's policy for the present study. Following The Health Insurance Portability and Accountability Act of 1996 (HIPAA), adolescent outpatients were recruited for the survey instead of hospitalized patients. The participants' ages were limited to 15 and 18 years old, and their medical conditions were not severe enough to be able to respond to the study survey without any additional support. The survey data was collected at the waiting area of the Adolescent Medicine Division with the assistance of the medical staff. The maximum survey time was twenty minutes. The present study was officially approved by the University of Kentucky Institutional Review Board for underaged adolescent participation.

2.2 Examination of Adolescents' Spatial Needs in Hospital Settings

Participants were asked to rate their spatial needs of hospital rooms in case of hospitalization on a 5-point Likert scale (1 = not important at all; 5 = very important). The questionnaires of adolescent spatial needs were developed based on adolescents' social needs and healing design attributes from the previous literature. The seven design attributes ascertained the importance of the following places: The seven spatial attributes of interest were as follows: 'able to see friends,' 'place to meet friends,' 'place for activities,' 'displaying personal items,' 'quiet place to go,' 'control of privacy,' and 'outside view.'

2.3 Photo Analysis of Activity Room Design Attributes

Four hospital activity room photos were selected from the existing children's hospital photos to explore adolescent activity room design attributes, differentiating each room's overall style and design elements such as color scheme, furniture style, potential activity, and wall decorations, as presented in Table 1. The selected activity rooms were characterized as rooms for colors, seating furniture style, wall decorations, supported activities, and privacy control levels. Room 1 intends to provide children or adolescent patients with a secluded retreat corner for restoration from stress by allowing them to be alone (Van den Berg et al., 2003) by incorporating natural elements in abstract forms for seating and a tree mural (Eisen, 2006; Pearson et al., 2019). Room 2 is a meeting place with sociopetal seating (Gifford, 1981), offering a meeting space where patients can meet with their friends beyond their rooms. While the seating looks comfortable, the seating is characterized by a traditional living room furniture layout with a centered large table in the area. Mural-covered one wall serves as a focal point of the room. The warm-colored checkerboard pattern on the flooring adds visual interest to the. With computer stations, individual seating, and bright lighting, Room 3 offers a social space with more activity options besides conversation. The design of the room potentially promotes adolescent patient activity with similar-aged patients, which supports adolescents' psychological needs for peer connection (Spear, 2000) while using computers. Finally, Room 4 had various surface finishes, lighting fixtures, colors, and room arrangement. Unlike Room 3, the low light level of the room generates coziness and comfort (Miwa & Hanyu, 2006). Further, the use of unusual openings in each corner of the room and non-traditional colors for hospital rooms generates an unfamiliar ambiance, which might be seen as attractive by adolescents.

Table 1. Descriptions of the Hospital Activity Rooms for the Present Study

Room	Description	Room Photo	Hospital Information
Room 1	• Main Colors: natural tone of colors such as yellow-green and brown • Furniture: round-formed seating and a curvilinear-lined retreat nook • Activity supported: being alone, conversation. • Wall deco: tree mural • Privacy control level: high		Activity room Children's Hospital in Berlin, Germany

Room 2	• Main Colors: split-complementary scheme with purple, blue • Furniture: traditional living room setting • Activity supported: conversation. • Wall deco: floor-to-ceiling mural • Privacy control level: low		Waiting room Phoenix Children's Hospital in Phoenix, AZ
Room 3	• Main Colors: less saturated warm tone colors with a contrast with gray blue. • Furniture: individual seating and workstations with computers. • Activity supported: play on computer, conversation. • Wall deco: decorative all lighting fixtures • Privacy control level: low		Computer room Dana-Farber Cancer Institute in Boston, MA
Room 4	• Main Colors: yellow and purple with blue, and red accents • Furniture: various furniture style, built and casual seating • Activity supported: conversation. • Wall deco: Geometric form wall opening, dark interior with accent lighting. • Privacy control level: medium		Teen activity room St. Jude Children's Research Hospital, in Memphis, TN

Note. Activity room photos, room 2 to 4, were from a book, titled "Designing the World's Best Children's Hospitals: the future of healing environments" (p.79, 93, & 114) by Bruce King Komishe, 2005, Australia. Reprinted with permission.

The participants evaluated the four activity room photos using twenty-two adjective words by rating their agreement level with each adjective word of the photos on a 5-point scale (1 = least agree, 5 = most agree). The developed adjectives for the photo analysis were smooth, comfortable, pleasant, roomy, stimulating, adult-like, safe, welcoming, connected, inviting, dynamic, flexible, controllable, private, warm, familiar, nice, enjoyable, bright, soft, feminine, and informal.

2.4 Statistical Analysis

The collected data was statistically analyzed. Descriptive statistics were conducted for the participant's demographics, spatial needs in hospitals, and activity room photo analysis. The survey data on photo images were analyzed by principal component analysis to discover the dominant design factors for adolescent patients. Further, correlations between the adolescents' spatial preference and activity room photo analysis were tested. Finally, regression was conducted to explore potential factors that might affect the adolescents' favorite activity room choices. The data obtained from this survey were analyzed using SPSS 28.

3. Results

3.1 Participants

Thirty-two adolescent outpatients completed the survey. Adolescent outpatients' gender, age, grade, and previous hospitalization history were collected as demographic data. The patient subjects comprised 13 males (40.6%) and 19 females (59.4%). About half of the participants were 15 years old (53%), and the average age was 16. Most of the participants were in the 10th grade in school. Fifteen participants among the thirty-two (47%) had hospitalization experiences before.

3.2 Adolescents' Spatial Needs During Hospital Stays

The participants evaluated spatial needs using scales of 1 to 5. The most highly rated spatial need was to 'control of privacy ($M = 4.77$),' echoing adolescents' significant need for autonomy in hospital environments. The second most highly rated need was a 'quiet place to go ($M = 4.25$).' Third rate adolescent spatial need was a 'place for activities ($M = 4.19$)', scoring similar to the value of 'outside view.' The need to 'display personal items' was scored the lowest. Both male and female adolescents rated over 3.5 out of 5 points for all seven spatial needs, as shown in Figure 2. The male adolescents responded with higher scores to 'place for activities,' 'quiet place,' and 'control of privacy' than females. However, the Wilcoxon Rank test did not detect significant differences between the genders.

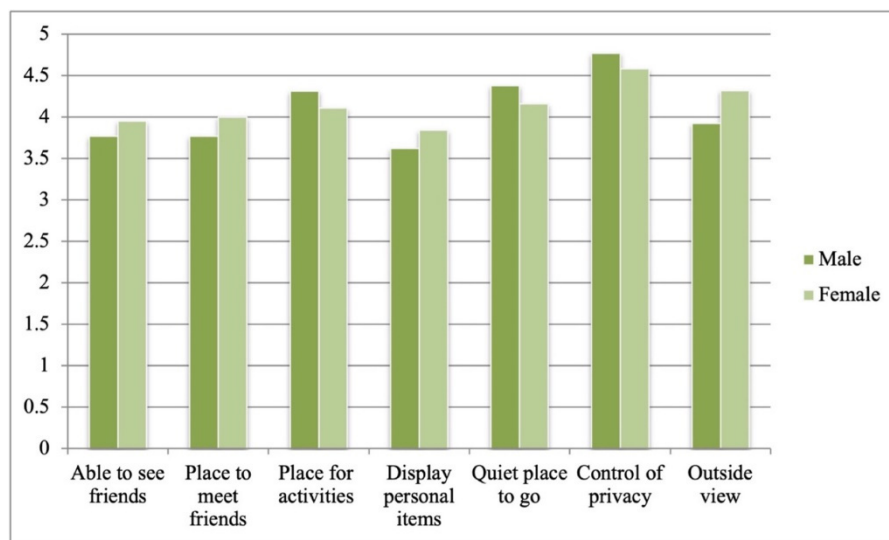


Figure 2. Spatial Needs Ratings by Gender

3.3 Dominant Design Attributes for Activity Room

The participants were asked to evaluate the four activity room photos based on the twenty-two evaluation adjectives on a 5-point Likert scale. This examination generated a total of 128 responses. A principal component analysis was conducted to discover dominant design attributes for activity rooms. Based on the Eigenvalue of the scree plot (the plot is not presented), three principal factors were identified based on the significance of loading scores (> 0.45), as presented in Table 2. Three dominant design attributes are recognized for activity room photos, comprising the common characteristics of each group such as 'enjoyable,' 'controllable,' and 'adult-like.' The mean scores for 'enjoyable,' 'controllable,' and 'adult-like' were 3.87, 2.86, and 2.87, respectively. The word 'stimulating' was excluded from the three principal factors due to the consistently lower than 0.45 loading score.

Table 2. Dominant Design Attributes for Activity Room

Adjective Word	Design Attribute	Mean score
smooth	Enjoyable	3.87
comfortable**		
pleasant**		
roomy		
welcoming*		
connected		
inviting*		
dynamic		
flexible		
familiar		
nice**		
enjoyable**		

safe		
controllable		
private	Controllable	2.86
warm		
bright		
soft		
adult-like*	Adult-like	2.87
informal		

Note. * Loading score > 0.70; ** Loading score > 0.80; No star > 0.45.

3.4 Adolescents' Favorite Activity Room Choices

Lastly, the participants were asked to choose the most favorite activity room among the four rooms (Table 1). Room 4 was the most chosen, obtaining 63 % of responses. Room 4 contained the most visual complexity in spatial design, including unusually shaped room openings and layouts, vivid color combinations, light-level contrast using spotlights, and non-traditional hospital furniture pieces. The interior partitions with angled openings visually connect to the other parts of the room while providing visual cues to the quiet corners. The second favorite activity room was Room 3, obtaining 31% preference. The workstations with computers and comfortable chairs allow adolescent patients to connect virtually outside the hospital and play with other adolescent patients and families in the room. The bright-colored wall lighting fixture might gather visual attention along with the primary colors. Only one adolescent favored Room 1 as a favorite room. Room 2 was not chosen by any respondents, decorated with formal seating imaging conventional waiting areas.

3.5 Relationship between Activity Room Design Attributes and Spatial Needs

Table 3 presents correlation coefficients and probabilities between the design attributes and spatial need variables. Overall, the correlations were not strong. 'enjoyable' was positively significantly related to 'display personal items' ($r = .210, p = .018$) but negatively significantly related to 'control of privacy' ($r = -.208, p = .018$). These results suggested that adolescents feel the room is more enjoyable when 'displaying personal items' is allowed. So having personal photos may appeal more 'enjoyable' to them. However, adolescents tend to feel the room less 'enjoyable' when the room doesn't allow them to 'control privacy.' Notably, 'controllable,' the second design attribute, was positively significantly associated with 'place for activities' ($r = .279, p = .001$), suggesting the need for activity rooms is strongly associated with adolescents' perception of controllability in hospital rooms. 'Adult-like' was significantly associated with 'being able to see friends' ($r = .222, p = .012$).

Table 3. Correlations between Design Attributes and Spatial Needs

Design Attribute	Spatial Needs						
	Able to see friends	Place to meet friends	Place for activities	Displaying personal items	Quiet place	Control privacy	Outside view
Enjoyable	.019 (.828)	-.039 (.662)	.119 (.179)	.210* (.018)	-.160 (.072)	-.208* (.018)	-.139 (.119)
Controllable	.096 (.284)	.061 (.497)	.279** (.001)	.042 (.639)	-.028 (.752)	-.028 (.752)	-.002 (.981)
Adult-like	.222* (.012)	.081 (.366)	.145 (.102)	-.007 (.942)	.129 (.147)	.129 (.147)	.028 (.749)

Note. N=128. * is p-value < .05, ** is p-value < .005.

3.6 Predictors for Favorite Activity Room

Repeated measured logistic regression was tested to predict influential design attributes on adolescents' favorite

activity room choices. The result showed ‘Enjoyable’ strongly significantly predicted adolescents’ favorite choices of activity rooms ($p < .0001$). This suggests that adolescents are more likely to choose the room as their favorite when they perceive it as enjoyable, which can be further described as a comfortable, pleasant, connected, inviting, and dynamic room.

Table 4. Favorite Activity Room Choice and Predicting Design Attributes

Parameter	Estimate	Standard Error	95% Confidence Limits		Z	$P > Z $
Enjoyable	1.6855	0.3897	0.9217	2.4493	4.33	<.0001
Controllable	0.0373	0.1505	-0.2576	0.3322	0.25	0.8044
Adult-like	0.3213	0.2029	-0.0765	0.7191	1.58	0.1134

4. Discussion

The healing process was defined as the development of personal wholeness, including physical, mental, emotional, social, and spiritual aspects (Egnew, 2005). Therefore, healing environments should provide physical stimuli generating relaxation, restoration, autonomy, and a sense of belonging. Patients experiencing some degree of healing may depend on individual preferences, physical conditions, and stages of life. Hospital environments compatible with patients’ physical and psychological preferences may enhance healing progression and achieve holistic health and well-being. As previously reviewed, adolescence is characterized by continuing physical and mental growth accompanying emotional, social, and cultural fluctuations. Therefore, desires for independence and peer connection influence adolescents’ behavioral decision-making and emotional well-being are influenced by desires for independence and connections with peer. The lack of autonomy and connection with peers in conventional healthcare settings may impair adolescent patients’ healing process. Thus, the present study aimed to explore age-appropriate design attributes in creating compatible healing environments with adolescents’ characteristics by acquiring adolescents’ spatial needs and activity room preferences.

One of the objectives of the study was to evaluate the healing design elements for activity rooms in hospital settings using existing hospital activity photos and examine spatial needs in hospitals. The findings confirmed that adolescent patients need areas for activities during their hospitalizations in addition to patient rooms. Adolescent patients can socialize with their peers while enjoying the age-appropriate ambiance in activity rooms when the room is designed to be compatible with adolescents’ characteristics. The current study supports Blumberg and Devlin’s (2006) findings on the need for hospital game rooms. The findings also support previous findings on adolescents’ sensitive attention to interior finishes, layout, and interior components of hospital rooms (Korpela & Hartig, 1996; Scopelliti & Vittoria, 2004), which suggest the potential healing effects of interior design on adolescent healing outcomes. Since coping with stress is critical to patients’ psychological well-being and health (Dise-Lewis, 1988; Lohman & Jarvis, 2000), the design attributes reflecting adolescents’ preferences in hospital rooms are presumed to function as healing stimuli and stress alleviators.

Hospital activity rooms can provide a place where adolescent patients can do age-appropriate activities with peers and holistically enhance their healing process. Through design, enhancing various activity opportunities for adolescents is essential to promote their optimal healing process and quality of life. The significance of ‘control of privacy’ and ‘quiet place to go’ in activity room design (Table 2) indicates, despite the previous research reporting the significance of social interaction among adolescents (Blumberg & Devlin, 2006; Bovier et al., 2004; Tivorsak et al., 2004), future designs should consider privacy as a central element. Preferences such as ‘place for activities’ and ‘outside view’ contain some merits of consideration in activity room design. The design attribute ‘enjoyable’ was the most dominant characteristic needed for adolescent activity rooms, which suggests somewhat different aspects from patient room design, which previously reported the value of the outside view (Kim 2022).

Activity rooms are critical to adolescents’ needs to reduce stress through autonomy, connection with peers, and some degree of self-expression. The characteristics of ‘comfortable,’ ‘pleasant,’ ‘welcoming,’ and ‘nice’ are included in the design attribute of ‘enjoyable’ with high loading scores (> 0.70), suggesting that design attributes for activity rooms should be differentiated from the patient room designs with more private and active properties. With high loading scores (> 0.80) from the factor analysis, ‘comfort’ and ‘pleasant’ are sub-attributes under the ‘enjoyable’ design attribute and matched with the activity room purpose of providing an enjoyable environment for emotionally stressed adolescents. In this aspect, the enjoyable activity room demonstrated a higher score than the other two attributes (Table 2), which reflects some agreement with other research results. The relatively lower

value of controllable demonstrated consistency with spatial preference evaluation. Even in stressful conditions, Bovier (2004) suggested that self-esteem was essential for adolescents' mental health. Interaction with their peers is critical to reducing stress through social activities. Since 'enjoyable' attributes are known to be related to restoration in activity room design (Korpeal et al., 2002; Scoelliti & Vittoria, 2004), the design targeting this aspect is critical to achieving adolescents' healing design approaches.

As adolescents feel comfortable, activity rooms can be perceived as more enjoyable. Based on the study's results, adolescent patients demonstrated a certain degree of complex desires between solitude and socialization in activity room design as appearing in the 'controllable' attribute. The adolescent responses indicated the preference for having safe and private environments simultaneously, indicating the tendency to keep social connections with peers without interruption. This speculation is an extrapolation of the previous research addressing the function and meaning of the living room as a private space (Rechavi, 2009). Burns (2009) interviewed adolescents between 13 and 19 years old to discover a sense of control over the environment crucial because of the emerging self-esteem and self-identity. Therefore, the ideal hospital activity room design may need some adoptions of characteristics from the living room at home. Individuals with more social support typically experienced less stress and maintained better health than socially isolated individuals (Cohen & Syme, 1985; Harbin, 2007). Although the value of family-centered care has been recognized in healthcare facilities since 1987, practical application is limited due to conflict with institutional policy and human issues (Abraham & Moretz, 2012). However, Blumberg & Devlin (2006) addressed the significance of flexibility in space use, such as activities for patients' families, scheduled overnight visits for guests, and occasional events for adolescent patients.

Research results indicated the importance of stress reduction in healthcare settings, especially for adolescent patients, due to the dynamic developmental changes in characteristics (Bovier et al., 2004; Huffcutt, 2010). As Ulrich et al. (2004) reported, environmental changes would impact adolescent patients' health with psychological stress from isolation and lack of privacy. When considering the hospital environment as a stressor, especially for inpatients with unfamiliar physical conditions (Kaplan, 1983), lack of privacy and disturbing environments may negatively influence hospitalized patients' healing. The environmental influence that potentially induces stress should be eliminated from the hospital room settings through sophisticated evaluation of design factors. Although medical treatments for patient conditions are the priority in their optimal healing process, stress-inducing physical hospital environments must be a significant healthcare concern because of the negative impact on health outcomes (Cohen et al., 1991). The critical value of psychologically supporting design elements should be promoted in healthcare designs to reduce stress and enhance the rapid restoration of patient health, as indicated in the current study's evaluation of the design elements.

5. Conclusion

The present study hypothesized that compatible healing physical environments with patients' characteristics contribute to their positive healing process. Hospital activity rooms can positively contribute to children and adolescent patients' healing process in hospitals. Due to the unique characteristics of the adolescence stage of life, the design of adolescent activity rooms must be differentiated from the rooms for young children. Adolescent patients prefer rooms bearing characteristics that are enjoyable, controllable, and active, which can support self-identity, peer connection, and stress reduction. The significance of the design elements proposes meaningful connections to creating a wholesome healing environment for adolescent patients by considering those elements. Therefore, the healing environments should be developed to boost patient's independence, confidence, and privacy while assuring a certain degree of socialization. Due to the transient growth stage, controllable interior components seem critical to a certain degree.

Furthermore, the preferences may vary depending on the purpose of the activity rooms. Separate foci must be considered in the design. Findings support adolescent patients' spatial needs in hospital activity rooms to promote adolescent patients' holistic quality of life in the hospital. More studies on age-appropriate design elements for adolescents are also required since physically and mentally fast-growing stages influence outcomes from hospitalization. The survey data were collected from adolescent patients who could respond to the questions even with some help from attending nurses or guardians, limiting extrapolation of the results beyond ages, cultures, and medical conditions.

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Informed Consent

Obtained.

Provenance and Peer Review

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Data Availability Statement

The data that support the findings of this study are available on request.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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